

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
29 November 2001 (29.11.2001)

PCT

(10) International Publication Number
WO 01/91045 A1

(51) International Patent Classification⁷: **G06K 19/00**

(21) International Application Number: PCT/US01/16328

(22) International Filing Date: 18 May 2001 (18.05.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/205,451 19 May 2000 (19.05.2000) US

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

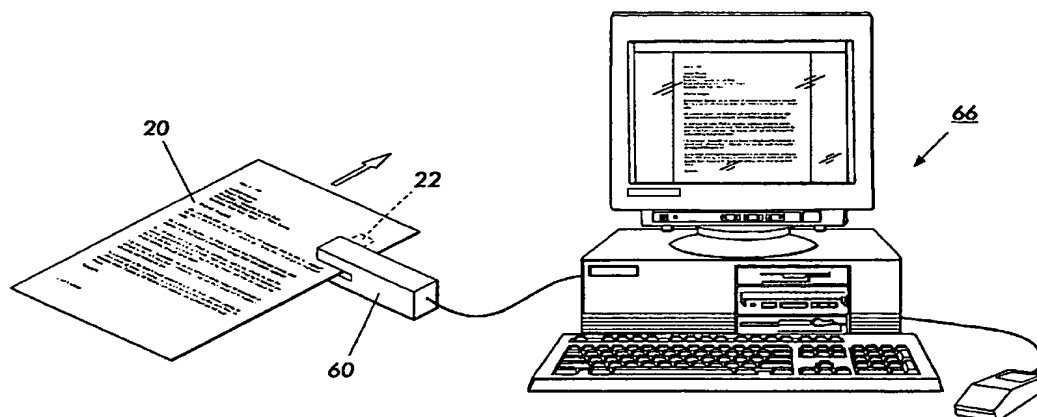
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DOCUMENT WITH EMBEDDED INFORMATION



(57) Abstract: The present invention is a method and apparatus (30) for embedding or associating (126) additional information with a document substrate (20). More particularly, the various embodiments are intended to improve the amount and availability of information associated with a document or other printed publication. The additional information is preferably provided in one or more of a number of embodiments employing embedded or affixed memory media (22) and devices. Various aspects of the embodiments may be employed by a document creator to provide additional information for the reader without drastically increasing the document size, and by a reader (60) of the document to access the additional information or to further supplement the information.

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DOCUMENT WITH EMBEDDED INFORMATION

TECHNICAL FIELD

This invention relates generally to a combination of a hard copy document
5 and digital information, and more particularly to a digital memory associated with a
paper medium (or other substrate), as well as the attachment of such memory to
the medium, so as to enable the incorporation of reference information with a
document.

CROSS-REFERENCE TO RELATED APPLICATIONS

10 Priority is claimed from Provisional Application 60/205,451 by Michael
Weiner, titled "DOCUMENT WITH EMBEDDED INFORMATION," filed May 19,
2000.

BACKGROUND OF THE INVENTION

The present invention is an apparatus for storing digital information within
15 memory associated with a document substrate.

It has long been desirable to capture, in electronic format the image found
on the printed page. To facilitate this need, many organizations use image
scanners and optical character recognition devices. However, scanning or
digitizing a document can be quite difficult. While it is feasible to capture the
20 bitmap image of a document, it may be difficult to perform optical character
recognition (OCR) on certain information, for example multi-column content,
certain fonts, multi-colored text etc.

It is also desirable to ship with a hard copy document an electronic image
and/or the word processing or presentation graphic file associated with the copy or
25 print. Today this would require either including a digital recording medium with the
desired data on it (e.g., CD-ROM, floppy disk) or electronically mailing (e-mailing)
the desired information. This can be a complicated and burdensome procedure
and one requiring a certain degree of technical acumen, or at least computer
familiarity, to accomplish.

Once the recipient gets the copy or print and the accompanying electronic formatted data, they tend to be disassociated from one another and stored in different locations. Later on, if the copy or print is being reviewed, the location of the CD-ROM or floppy disk or e-mail that contains the desired electronic content
5 may or may not be easily determined.

It is also believed to be desirable to include electronic attachments on a cover memo without having to include the entire printed version. For example, a sender might wish to send a summary page or two with a large number of attachments, and have the attachments included only in electronic format. Once
10 again, the above-mentioned problems come into play.

In today's global economy we often communicate, via written documents, with people who speak languages other than our own. In some situations, it would also be desirable to include translations of the document(s) in additional languages. While the technology to automatically create the translation is
15 available, with improving translation accuracy, the process still requires that a high-quality electronic or digital image be available in machine-readable form to enable machine translation.

One aspect of the present invention is directed to an improvement to copiers and printers that allow them to add digital information to a printed or
20 copied page or booklet or other output electronic information. This information is electronically transmitted into a memory device built or embedded within the paper medium (or other substrate), in one embodiment, and is attached onto the medium in a second embodiment; neither of which impact the visual features of the document itself.

25 In another aspect of the present invention, there is provided a handheld recording apparatus (e.g., audio), including a recording mechanism for recording, on a recording medium, information to be retrieved at a later time and means for attaching the recording medium to a substrate.

Heretofore, other patents and publications have disclosed the embedding
30 of information, the relevant portions of which may be briefly summarized as follows:

US Patent No. 5,517,407 teaches a means of embedding memory into a book and then searching a microchip or other memory using a common

connector. If this system were to come into vogue then copiers and printers could output to that type of memory and connector, and take advantage of an installed base of users.

Xerox Corporation announced in 1998 an "electronic staple" that holds the
5 URL address of one or more pages on the Internet that relate to the printed page. Similarly, electric paper described by Sheridan et al., and an alternative invention by MIT Media Lab (E-Ink) disclose mechanisms for dynamically displaying information on a flexible substrate. These pages can be imaged electronically and have a variety of advantages and differences from ordinary paper that is taught in
10 U.S. Patents Nos. 5,708,525, 5,751,268, 5,914,805 and 6,055,091 assigned to Xerox Corporation, and as also described by J. Jacobson et al. in U.S. Patent No. 6,017,584 and 6,124,851 and in various papers prepared on electronic paper, electronic books and "e-ink."

DISCLOSURE OF INVENTION

15 In accordance with the present invention, there is provided a printing apparatus, including: printing means adapted to print a user perceptible image on a substrate, where the substrate has a digital recording medium associated therewith; and a digital output device for recording, on the digital recording medium, digital information to be stored thereon for subsequent retrieval.

20 In accordance with another aspect of the present invention, there is provided a substrate, including: at least one facestock layer suitable for the receipt of marks thereon; and a non-visual recording medium associated therewith, wherein information can be recorded to and read from the recording medium.

In accordance with yet another aspect of the present invention, there is
25 provided a handheld recording apparatus, including: a recording mechanism for recording, on a recording medium, information to be retrieved at a later time; and means for associating the recording medium to a substrate.

One aspect of the invention deals with a basic problem in the creation and use of hard copy documents – even in the computer age, once a document is
30 created and printed, the printed document becomes disassociated from the data used to create it. This aspect is further based on the discovery of a technique that alleviates this problem. The technique eliminates the traditional disassociation by

combining with a document substrate a memory device of similar medium where it is possible to store information associated with the document created. Moreover, the data stored may be more than simply information representing the content of the document. It may include information that expands the scope of the document (e.g., translations, bibliographic information, audio information, graphics accompanying text, interactive quizzes, multimedia, glossaries, incremental technical details, etc.).

The technique described herein is advantageous because it makes it unnecessary to have digital and hard copies of documents stored in separate locations, and because it can be adapted to any of a number of substrate materials (not limited to paper substrates). The techniques of the invention are advantageous because they permit efficient storage and transmission of information. What's more, because the transportation of a document incorporating both hard copy and its related digital information requires the two to remain associated, a recipient of the document only has to deal with the document one time, rather than having to request digital copy, etc. Some of the techniques can be used to increase the amount of information that may be transferred with a document (e.g., attachments, bibliographic information, etc.) As a result of the present invention, it is believed that a workplace may become more efficient as result of the association between a document and its related digital data / information. It is further an advantage to be able to ship electronic information, which is accompanied by a hard copy, a feature accomplished by this invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1 – 3 illustrate various embodiments for a substrate in accordance with one aspect of the present invention;

Figure 4 is a simplified illustration of a printing device adapted to work with the substrate of Figure 1 in accordance with another aspect of the present invention;

Figure 5 is an illustrative embodiment of a handheld recording and receiving device suitable to work with the substrate of Figures 1 – 3; and

Figure 6 depicts an exemplary process in which various aspects of the present invention are utilized.

The present inventions will be described in connection with a preferred embodiment, however, it will be understood that there is no intent to limit the inventions to the embodiment described. On the contrary, the intent is to cover all alternatives, modifications, and equivalents as may be included within the spirit and scope of the inventions as defined by the appended claims.

MODES FOR CARRYING OUT THE INVENTION

For a general understanding of the present invention, reference is made to the drawings. In the drawings, like reference numerals have been used throughout to designate identical elements.

Referring to Figures 1 - 3, there are depicted illustrative embodiments of an aspect of the present invention. In particular, there is shown a substrate sheet 20 having a memory device 22 embedded within or attached to a surface thereof. In the embodiment of Figure 2, the embedded memory device 22 is physically embedded within or between one or more layers of the substrate, preferably during its manufacture, so as to be concealed from visual detection by a viewer of the substrate. The substrate 20 preferably includes at least one layer of a paper or comparable facestock that is conducive for various copying and printing tasks, such as ordinary bond paper, cloth or linen paper, of any size and weight and color; and may also include other materials such as transparency materials, labels, card stock, vellum, polyesters and other polymers, TYVEK® and other never-tear coated sheets (e.g., as described by Malhotra in U.S. Patent No. 5,075,153, issued Dec. 24, 1991). It is also understood that the substrate may be in the form of electric paper employing twisted balls or cylinders as taught by Sheridan et al., for example, in US Patents Nos. 5,708,525, 5,751,268, 5,914,805 and 6,055,091 assigned to Xerox Corporation, and as also described by J. Jacobson et al. in various papers prepared on electronic paper, electronic books and "e-ink."

Similarly, in the embodiment of Figure 3, the embedded memory device 22 is physically attached to a surface (upper or lower) of substrate 20. In any of the various embodiments, it is intended that the substrate be usable in the same manner as conventional paper or similar substrate materials – meaning that the substrate remains suitable for transport and marking with conventional printing or

copying means. Such printing means necessarily include ink and xerographic printing systems, silk-screening equipment, photographic printing equipment, painting and other methods of placing marks or images on the substrate.

The embedded memory 22 is preferably semiconductor memory. Semiconductor memory continues to enjoy the benefits of increasing capacity and reduced cost, and flash memory and equivalents now allow putting information in memory without the time consuming and costly masking process traditionally associated with programmable devices. Information can be burned into semiconductor memory on demand. Embedded memory device 22 is preferably a chip, a strip of bubble memory, a laser imageable surface, as described, for example, in U.S. Patent 4,835,376 to Drexler, and as described in an article by *Wired News*, "Inventor Warns MS on Patents," by James Glave, 5/11/98. Alternatively, the memory may be in the form of a conventional magnetic tape or strip (e.g., magnetic recording tape or magnetic card strip) that is embedded or applied to the substrate. As will be appreciated, the embodiments depicted in Figures 1 – 3 allow for the coexistent shipment of hard copy and digital information, whether it be the shipment of a document and its associated digital information, or the shipment of digital media and an associated document related to such information.

In yet another alternative embodiment, the embedded memory may be an optical or laser-imageable medium such as found in a CD ROM, wherein the embedded memory can contain information embedded by laser on the flat surface and later read by a reader. Examples of such technology are U.S. Patent 4,835,376 to Drexler. In any of the various substrate-memory embodiments, it is possible to either embed into the print/copy substrate or to affix onto it embedded memory 22, positioned in such a way as to allow information to be transferred into the memory, and for information to be retrieved therefrom.

In a preferred embodiment, the embedded memory device is not only flexible in nature, preventing it from interfering with normal use of the substrate, but also very dense in terms of the information that can be stored thereon. Embedded memory 22 is suitable for use in storing information such as information related to the formation of the image on the substrate. For example, the stored information may include a bitmap image(s), textual content of the

document, an alternative version of the document (e.g. translation), information relative to the transfer or reproduction of the document image, or other machine-readable information relevant to the document (e.g., bibliographic, footnotes, related URLs, appendices, annotations, reviews or comments by recipients of the document, etc.).

Referring next to Figure 4, depicted therein is an exemplary copying / printing means 30 having a platen glass 32 on which a document (not shown) is placed in order to capture and reproduce its image. A substrate 20, such as paper, is imaged by one of a variety of means, which in the illustrated embodiment is a xerographic printing system having a photoconductor 38. While moving through the printing system 30 the substrate 20, having a memory component 22 associated therewith, is electronically (via EMF or other means) endowed with an image which has been constructed, converted, and stored using electronic subsystem (ESS) 40. ESS 40 may be a conventional, processor-based system suitable for receiving a digital bitmap, for example from a CCD array 44, and processing the image to produce one or more versions thereof including, for example, an optical character recognized text image, a color image, and/or a digitally enhanced image.

The image preferably includes a sequence of digital signals representing the output of any of a number of well-known scanning systems built into the copier or printer, and as represented by the manner in which the image of a document on the platen glass is reflected at mirror 46 and vectored toward CCD array 44. In turn, CCD array 44 captures the image and transmits it to ESS 40, or alternatively, to a personal computer or other image signal receiving device external to the system for processing, storage and further application.

During the processing of a document that is printed in a conventional xerographic manner, information may be transmitted from the ESS 40 to a writing device or "head" 48 that is suitable for transferring digital information so as to store the information within the embedded memory device or element 22. As will be appreciated, the writing head is able to cause the transfer of information when the embedded memory device 22, within the substrate 20, is passed in close proximity to or touching writing device 48. Such is the case for substrates having a memory device embedded or associated therewith.

In an alternative embodiment, the copier or printer itself may generate and affix the memory device, or may affix a memory device in conjunction with a visual display or other output device (e.g., a speaker) as described, for example, in the co-pending application previously incorporated by reference. For example, whenever a copy or print is made, the system can optionally impose upon the copy/print a memory attachment, such as a taped-on memory capability. It will be appreciated that in such embodiments, it may be preferable to have the memory device at an output or post-printing position so as to assure that the copy is complete, or that the copy process itself does not negatively impact the data stored on the memory device 22.

The preferred embodiment is intended to comprise the various ways in which this feature is deployed in printers and copiers, such as where a page image or bitmap is captured and stored in attachable or embedded memory, or where other machine readable content is transmitted and stored in attachable or embedded memory. Such information may include, for example: the type of original that is being copied; the type of electronic file that is being printed; an indication of whether the electronic file contains machine readable information delineating text, font type, etc.; the font style, type or size; page description language information; an associated sound file (e.g., .wav); index or table of contents data; language translation data; ancillary and enhancing data; and maps, etc. It is further contemplated that the storage capacity may be in proportion to the number or size of the memory devices associated with a substrate. Where, in one embodiment, various lengths or sizes of memory may be applied, depending upon a user's requirements.

For example, a copier can have a microphone built into it and while making copies a user can embed a descriptive or other message onto the page, or add music to the page. One might think of the publishing metaphor that has developed for web page viewing enhancements, and think about the paper or other substrate as either a single viewing image with multiple electronic embedded options and enhancements. Or, a gyricon-type display (paper like substance that can be manipulated electronically to produce a variable image, which one day will include full motion video) could be employed to provide many of the enhancements and features found on interactive web pages.

It will be further appreciated by those skilled in the art of printer/copier electronic design that various well-known features and functions may be carried out by system controls embedded within the ESS. Such features may include tracking of critical status and parameter information such as ready, imaging & printing parameters selected, page layout including simplex or duplex
5 imaging/printing, color, size reduction, editing including edge deletion, etc.

In an alternative embodiment, an optional read/write device 50 allows the system 30 to store images (or other digital information relative to the document) onto external portable media such as floppy disk, PC Card or CD-ROM. Optional
10 read-write device 50 may also be used to deliver information to the copier/printer that it will place onto the substrate. For example, a user may insert a CD-ROM, select files on the CD as attachments to the document, and create multiple originals, each with printed information and stored digital information. Furthermore, it is contemplated that additional features would enable the copier/printer depicted
15 in Figure 4 to increase its utility by capturing and storing/embedding voice, presentation graphics, and other content that is directed to or directly sensed by the system.

As a further alternative or optional embodiment, the copier/printer system 30 may also include an embedded memory reading device 54 to read information
20 from substrates that already have embedded memory associated therewith. It will be appreciated that such a device may either be incorporated in the data writing device 48, or may be accomplished via a separate device – perhaps associated with a document feeder or handler (not shown). A read device would allow the copier/printer to read information from pages that have the embedded memory,
25 store the information using memory associated with the ESS, and optionally merge the information and re-image or reproduce it on other documents. For example, if a user receives a printed substrate having embedded memory with content recorded on it, the user needs to be able to go to the “copier” and have the material reproduced (to the extent it is visual information), the holistic
30 document, visual image and electronic image. To do so the copier / printer needs to optionally read in the electronic data.

It will be appreciated that various uses for the system described herein will result in particular embodiments. One such use is as a business communication

or document that typically has a cover letter with attachments. Using the present invention, it will be possible to send the letter, using an embedded memory substrate, in a single sheet – where the attachment information is stored in a compressed digital form in the embedded memory. To “read” the attachments,
5 the recipient simply retrieves the information from the embedded memory using a reader similar to that described above.

The recipient of a page which has an embedded image or information needs to be able to conveniently retrieve the information. One embodiment of the present invention includes a ROM-based semiconductor device that may be read
10 by a clip-on connector and microprocessor which reads the ROM and transfers the data to a display, personal computer, or a personal digital assistance device (e.g., Palm Pilot). However, those skilled in the art will recognize that there are many alternative means of storage, including magnetic tape, or the laser embedded substrate noted above. It is further anticipated that certain solid-state memory
15 devices and their respective connectors, may become ubiquitous. When a standard emerges which has a critical mass of users it is anticipated that copier and printer manufacturers will be compelled to adhere to it.

One possible embodiment might be the “Memory Stick” by Sony. Memory Stick is an ultra-small, high-capacity durable media designed to link a host of
20 different digital products by capturing and sharing digital content – whether images, text or music files. Sony’s line of Memory Stick products includes Cyber-shot digital cameras, Handycam camcorders, VAIO personal computers, a Memory Stick Walkman personal stereo, a voice recorder, a Memory Stick printer, the CyberFrame digital photo frame, and AIBO entertainment robot. Sony
25 currently sells a 64 MB capacity Memory Stick, and higher capacity media. Sony also offers a floppy disk adapter, PC card adapter, USB adapter and parallel port adapter, enabling connectivity of Memory Stick media to virtually any PC.

In the Memory Stick, a tiny micro controller connects to a flash memory chip on one end. On the other end a 10-pin flat-contact connector with guide grooves
30 on the Memory Stick’s underside ensures reliable data exchange up to a million times. Because data is contained on a silicon chip instead of on a tape or disk, no motor, magnetic head or optical pickup is necessary. This allows products to be smaller, lighter and more efficient. Memory Stick’s RAM holds data for an

indefinite period and withstands heat, dust and rough handling. Memory Stick provides instant data transfer, and data can be recorded, erased and re-recorded.

Furthermore, the use of a ubiquitous connector that can intermediate between the connector used in embedding chips (or other memory devices) in copies and prints, and the myriad of PDA's, desktop computers and convergent
5 devices that continue to proliferate the market will be of significant importance.

In yet another alternative embodiment, the embedded or associated memory 22 (Figure 1) may be implemented using an optical memory technology such as the laser read/write system disclosed in U.S. Patent 4,835,376 to Drexler,
10 and other patents by Drexler Technology Corporation, hereby incorporated by reference for its teachings. In particular, a strip of laser recordable optical data storage material may be adhered to or embedded within the substrate. A laser may then be able to record the information in the reflective particles that form the optical strip, thereby allowing subsequent retrieval of the information by another
15 optical reading device.

In yet another alternative embodiment, depicted in Figure 5, it is contemplated that a handheld machine 60, similar in size to that used for dictation may supply the recorded information. In one embodiment device 60 is a handheld device suitable for feeding a document sheet or substrate 20 therethrough. As
20 described above, device 60 may have a head or similar recording or exposure mechanism so as to create, on a medium 22 associated with the document, a series of recorded digital signals that may subsequently be read from the medium as it moves through the device in the direction indicated by arrow 64. As depicted in Figure 5, device 60 may be electronically interfaced, via wired or wireless
25 interface (e.g., Infra-red interface), to a computer workstation 66, and is capable of both receiving information to be recorded on memory 22 and for transmitting information read from memory 22.

For example, the visual image appearing on the facestock of substrate 20 may also be sent from workstation 66, where it is recorded onto memory 22.
30 Similarly, if substrate 20 is received, it may be fed through device 60, where the data contained on the embedded memory 22 is read and transmitted to workstation 66 for review by the recipient. It will also be appreciated that conventional substrate materials may be used, and the recording medium simply

recorded and affixed to the substrate (along a margin, on an unprinted surface, etc.). It may also be possible to produce a visually transparent memory device to allow the application of a tape or label containing recorded information at a consistent location without concern about the memory 22 interfering with the visual information depicted on the substrate. It is also contemplated that device 60 may be designed so as to integrate with existing document printers and scanners and multifunction machines so as to facilitate the recording and reading of stored data in conjunction with other document operations. Furthermore, a machine that applies memory 22 to the surface of a substrate, may also include suitable mechanisms to allow the memory, or other items affixed to the substrate by the machine, to position the memory in a selected position.

In particular, the device may include means for producing an adhesive-backed tape or memory stick that includes voice information recorded thereon, and that is easily affixed to the substrate. Such a device would combine elements of electronic or digital recording apparatus as are well-known for dictation equipment with the adhesive tape output known for label making devices (e.g., K-Sun label Lab, Brother, etc.).

It will be appreciated by those familiar with the recording and storage of digital information that handheld device 60 likely includes a read and/or write mechanism (e.g., magnetic recording head). The read/write mechanism may also have an associated document movement sensor (e.g., a nip roller connected to an encoder,) or even a document drive mechanism, so as to assure that the information may be recorded and subsequently read from the memory 22. In an embodiment where memory such as a memory stick is employed, the handheld device would operate as a port, into or to which the memory could be attached for read and write access.

The handheld embodiment allows a user, at their preference, to annotate any paper document (ordinary paper, a magazine, a book, electric paper, et al) with a sound byte or perhaps other character-based information (entered via a key pad or personal digital assistant interface). For example, if a user is reading a draft patent application on paper and has some comments, the user could record the comments or other information (in digital or analog form). Instead of having to play the information back, or send it as a separate recording, the present

embodiment contemplates outputting the information to a magnetic media that can be affixed to the document as previously described.

More specifically, the handheld device 60 may be a tape recorder that outputs a recorded strip, as taught above, that affixes to the page. In the
5 embodiment described, the handheld recording device outputs a self-adhering, stamp or label-like item that the user affixes to the document. In an alternative embodiment, the recorder could transfer or record the information to the memory embedded within or affixed to the substrate. The user then mails or sends the document to the creator and the creator can listen to the comments. This can be
10 with or without viewable markups (may not be able to read handwritten notes, or they may be too voluminous).

Furthermore, this embodiment overcomes several disadvantages of conventional dictation equipment, as the comments are directly affixed to specific documents. Thereby avoiding a search for the relevant comments or having to
15 match up various documents addressed by a single dictation tape.

Turning next to Figure 6, depicted therein is an exemplary representation of various steps described with respect to the creation and use of a substrate having digital memory associated therewith. It should be understood that various steps may be completed in an alternative order, or eliminated completely in accordance
20 with a particular use for such an invention. Referring to the figure, step 100 illustrates the step of creating a digital representation of a document, using as input, stored digital information and data 103. At some point, the document is created or rendered as a hard copy (by printing or copying) at step 106. The associated digital information or data 103 may also be recorded on, or attached to
25 the document substrate at step 108, in a number of techniques described above. Once the hard copy document and its associated digital information are complete, the document may be sent to a recipient at step 110.

Upon receipt by a recipient (step 120), the document substrate may then be viewed or read at step 122, and the associated digital information and data may
30 be read and reviewed or stored at step 124. Step 126 indicates that additional information in the form of annotations may be added, or that new information may be saved on the associated memory, before the document is stored or resent as represented by step 130. Although not specifically illustrated, it will be appreciated

that certain steps may be executed in a repeated or looping fashion, or that additional or alternative steps may be added to the process depicted. Accordingly, the process illustrated in Figure 6 is intended primarily for illustrative purposes only - to explain the advantages of the present invention.

5 In a further modification, the handheld device 60 is not limited to audio recording, but may be capable of taking a digital "photograph" of anything, including a page of a book, magazine or document (e.g. magazine in the dentist's waiting room that I cannot take with me). The recorded digital image, and/or recorded comments are then easily sent to another party. For example, the digital
10 image and comment may either be sent electronically, or saved onto a magnetic tape that is then attached to the patent draft to depict and further explain an element of the invention.

 In recapitulation, the present invention is a method and apparatus for combination of a hard copy document and digital information, and more
15 particularly to a digital memory associated with a paper medium (or other substrate), as well as the attachment of such memory to the medium, so as to enable the incorporation of reference information with document.

 It is, therefore, apparent that there has been provided, in accordance with the present invention, a method and apparatus for combining a hard copy
20 document and digital information. While this invention has been described in conjunction with preferred embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all such alternatives, modifications and variations that fall within the spirit and broad scope of the appended claims.

CLAIMS

1. A printing apparatus, including:
printing means adapted to print a user perceptible image on a substrate,
5 where the substrate has a digital recording medium associated therewith; and
a digital output device for recording, on the digital recording medium, digital
information to be stored thereon for subsequent retrieval.
2. The printing apparatus of claim 1, further including means for affixing the
digital recording medium to the substrate.
3. The printing apparatus of claim 2, wherein said affixing means operates
to affix the digital recording medium after printing upon the substrate.
4. The printing apparatus of claim 1, further including:
a digital input device for reading, from the digital recording medium, digital
10 information to stored thereon.
5. A substrate, including:
at least one facestock layer suitable for the receipt of marks thereon; and
a non-visual recording medium associated therewith, wherein information
can be recorded to and read from the recording medium.
- 15 6. The substrate of claim 5, wherein the medium is selected from the group
consisting of:
an electronic recording medium;
a magnetic recording medium; and
an optical recording medium.
- 20 7. The substrate of claim 5, wherein the medium is selected from the group
consisting of:
a memory chip;
a memory stick;
a strip of bubble memory;
25 a laser imageable surface; and
a magnetic tape.
8. The substrate of claim 5, wherein the medium is re-recordable.
9. The substrate of claim 5, wherein the non-visual recording medium is
generally embedded within the substrate.

10. The substrate of claim 5, wherein the non-visual recording medium is affixed to a surface of the substrate.

11. A handheld recording apparatus, including:

a recording mechanism for recording, on a recording medium, information
5 to be retrieved at a later time; and
means for associating the recording medium to a substrate.

12. The handheld recording apparatus of claim 11, wherein said means for associating the recording medium with a substrate includes an adhesive-backed recording medium.

10 **13.** The handheld recording apparatus of claim 11, wherein the apparatus is capable of sensing and recording audio information.

14. The handheld recording apparatus of claim 11, wherein the apparatus is capable of sensing and recording video information.

15. The handheld recording apparatus of claim 11, further including:
15 a digital input mechanism for reading, from the recording medium, digital information stored thereon.

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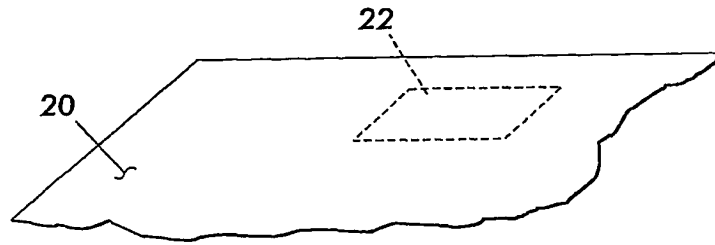


FIG. 1

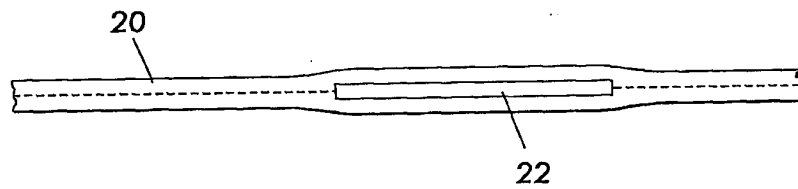


FIG. 2

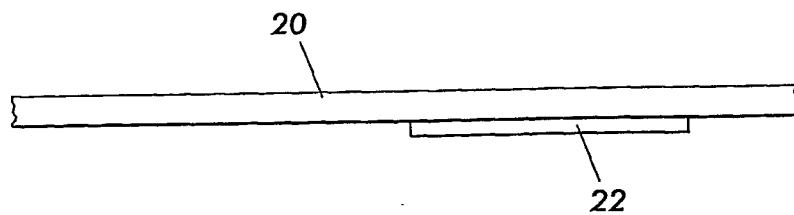


FIG. 3

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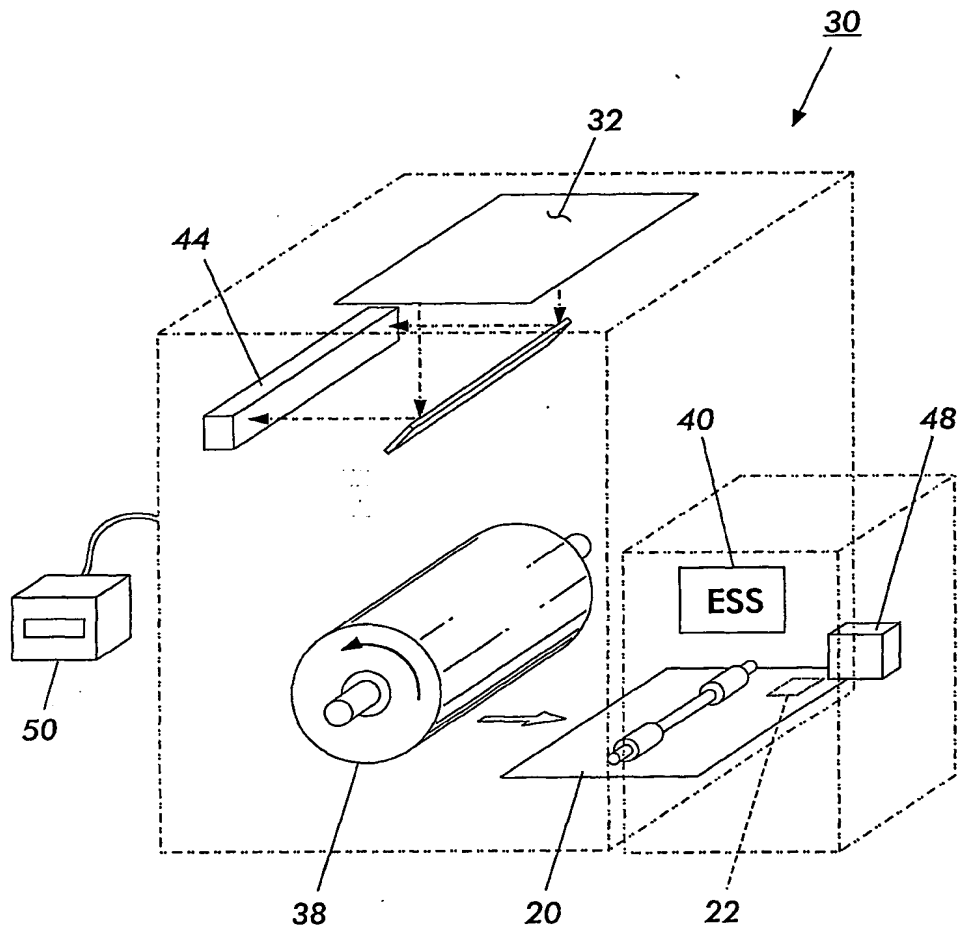


FIG. 4

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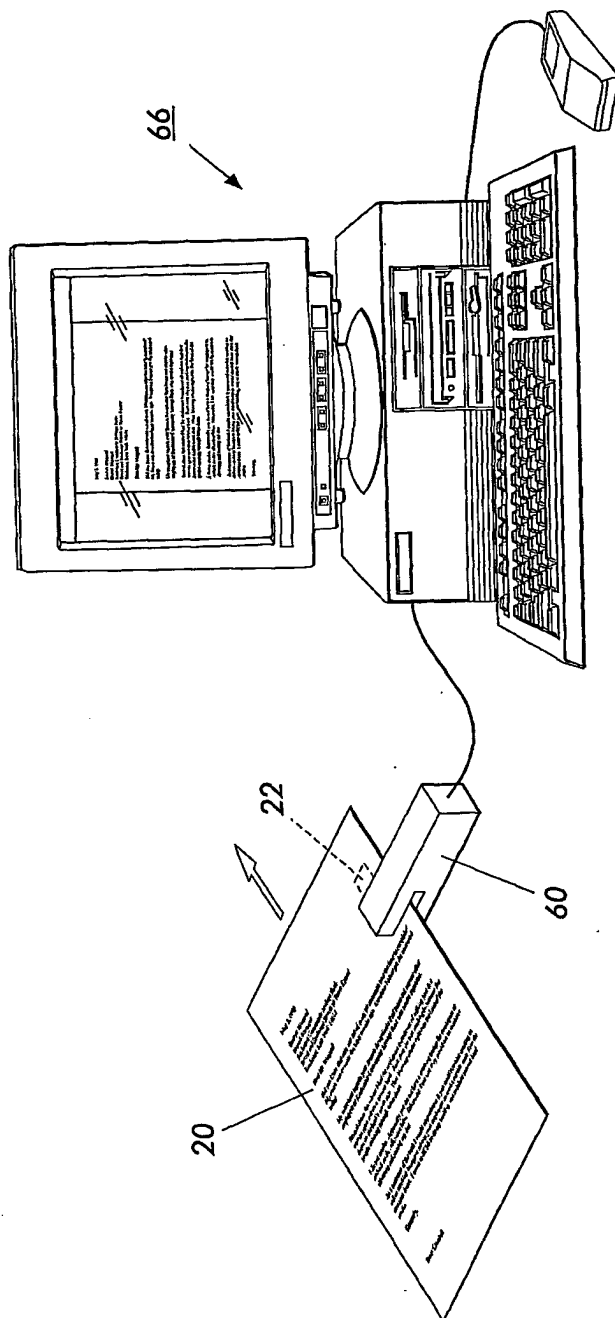


FIG. 5

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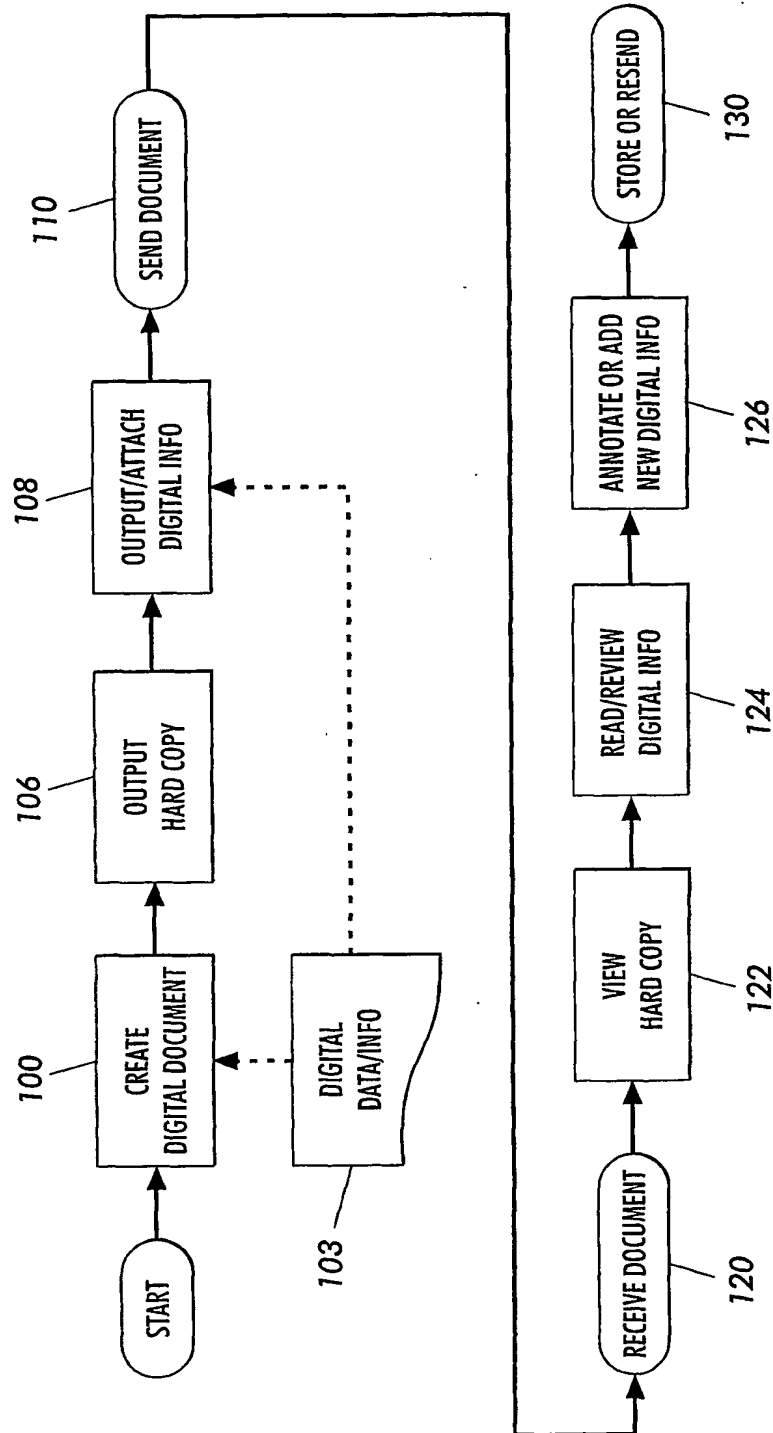


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/16328

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :G06K 19/00

US CL :235/487

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 235/487, 375, 380

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
N/AElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Extra Sheet.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,479,003 A (YAMADA) 26 December 1995 (26/12/95), col 4 lines 54-60, Figures 1,2,5.	1-15
A	US 5,455,410 A (SCHNEIDER) 03 October 1995 (03/10/95), see entire document.	1-15
A	US 5,981,123 A (MATSUO et al.) 09 November 1999 (09/11/99), see entire document.	1-15

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

19 SEPTEMBER 2001

Date of mailing of the international search report

05 NOV 2001

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/16328

B. FIELDS SEARCHED

Electronic data bases consulted (Name of data base and where practicable terms used):

BRS

search terms: substrate, digital adj5 recording, printer, magnetic, optical, electrical, memory, "digital output", file, "bar code", reader, scanner,

